Rapid Prototyping

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Rapid prototyping, in its most general form, involves the direct production of a prototype in three dimensions from a computer-aided drawing. MSFC is directed at integrating rapid-prototyping technologies with current manufacturing practices and developing rapid-prototyping processes to manufacture complex materials needed in future NASA programs. Growing in its ability to cut the design-to-product development cycle, the process enables manufacturers to shorten prototype development costs by orders of magnitude. As an example, MSFC is producing wind-tunnel models for $400 that once would have cost $40,000.

The net-shape master and mold-complex geometry-fabrication technologies employed by rapid prototyping are reaching into the production environment, reducing costs, improving reliability, and providing additional—or exclusive—fabrication routes for the introduction of complex, lightweight materials into future products. These products will include the next generation of space vehicles, such as the X–33 and X–34, and will also include various “down-to-Earth” products that will simply benefit from being lighter, yet stronger.

At present, MSFC’s Rapid Prototyping Center uses a variety of machinery to complete its tasks: a fused deposition modeler, used to make investment master castings, particularly of wind-tunnel models; a Sanders three-dimensional printer to produce high-detail, high-surface-finished investment master castings; and a stereolithography device that produces wind-tunnel models and other visual aids. A fourth device, a ballistic particle machine to be used in rapidly making inexpensive concept models, is coming on-line.

Traditionally, prototypes cost many thousands of dollars, and it is only by commercially marketing a design that costs can be recovered by industry. Cutting the costs of prototype fabrication by a factor of 10 or 100 will result in enormous savings in product development and may encourage firms to explore alternative, potentially better designs. Extrapolating this to the consumer, the price paid for a new or improved product may be substantially lower since the manufacturer does not have to recoup high research and development costs. A number of major firms in the United States are experimenting with various aspects of rapid prototyping, and MSFC is poised to assist the small-business person in deciding on how to invest in the technology.

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